

## CLAIMS

What is claimed is:

- 1    1. A method of producing nitride based heterostructure devices comprising the  
2    steps of:
  - 3       providing a substrate;
  - 4       applying a first layer over the substrate wherein the first layer includes  
5       nitrogen; and
  - 6       applying a dielectric layer over the first layer wherein the dielectric layer  
7       includes silicon dioxide.
- 1    2. The method of claim 1, wherein the substrate includes one of the group  
2    comprising sapphire, silicon carbide, a spinel substrate and silicon.
- 1    3. The method of claim 1, wherein the first layer further includes a binary  
2    compound including one element of the group comprising group III elements.
- 1    4. The method of claim 1, wherein the first layer further includes a ternary  
2    compound including two elements of the group comprising group III elements.
- 1    5. The method of claim 1, wherein the first layer further includes a quaternary  
2    compound including three elements of the group comprising group III elements.

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1    6. The method of claim 1, further comprising applying a second layer between  
2    the first layer and the dielectric layer wherein the second layer includes nitrogen.

1    7. The method of claim 6, wherein the first layer further includes a binary  
2    compound including one element of the group comprising group III elements and  
3    the second layer further includes a ternary compound including two elements of  
4    the group comprising group III elements.

1    8. The method of claim 6, wherein the first layer further includes a ternary  
2    compound including two elements of the group comprising group III elements  
3    and the second layer further includes a quaternary compound including three  
4    elements of the group comprising group III elements.

1    9. The method of claim 1, further comprising:  
2         applying a first and a second ohmic contact to the first layer; and  
3         applying a gate contact to the dielectric layer.

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1 10. A method of producing nitride based heterostructure devices comprising the  
2 steps of:

3 providing a substrate;  
4 applying a first layer over the substrate wherein the first layer includes  
5 gallium and nitrogen; and  
6 applying a dielectric layer over the first layer wherein the dielectric layer  
7 includes silicon dioxide.

1 11. The method of claim 10, wherein the substrate includes one of the group  
2 comprising of sapphire, silicon carbide, a spinel substrate and silicon.

1 12. The method of claim 10, further comprising applying a second layer between  
2 the first layer and the dielectric layer wherein the second layer includes  
3 aluminum, gallium and nitrogen.

1 13. The method of claim 12, wherein the substrate includes one of the group  
2 comprising sapphire, silicon carbide, a spinel substrate and silicon.

1 14. The method of claim 12, wherein the first layer further includes aluminum  
2 and the second layer further includes indium.

1       15. A nitride based heterostructure device comprising:  
2           a substrate;  
3           a first layer over the substrate wherein the first layer includes nitrogen;  
4       and  
5           a dielectric layer over the first layer wherein the dielectric layer includes  
6       silicon dioxide.

1       16. The device of claim 15, wherein the substrate includes one of the group  
2       comprising sapphire, silicon carbide, a spinel substrate and silicon.

1       17. The device of claim 15, wherein the first layer further includes gallium.

1       18. The device of claim 15, further comprising a second layer positioned between  
2       the first layer and the dielectric layer wherein the second layer includes nitrogen.

1       19. The device of claim 18, wherein the second layer further includes aluminum  
2       and gallium.

1       20. The device of claim 18, wherein the second layer further includes indium.

1       21. The device of claim 18, wherein a composition of the first layer changes over  
2       distance and a composition of the second layer changes over distance.

1       22. The device of claim 18, wherein a composition of the first layer remains  
2       substantially constant over distance and a composition of the second layer  
3       remains substantially constant over distance.

1       23. The device of claim 15, wherein the device is used as one of the group  
2       comprising a photodetector, a field effect transistor, a gated bipolar junction  
3       transistor, a gated hot electron transistor, a gated heterostructure bipolar junction  
4       transistor, a gas sensor, a liquid sensor, a pressure sensor, a multi function sensor  
5       of pressure and temperature, a power switching device and a microwave device.